REMARKS

The Office Action of February 22, 2007 has been carefully considered. In response, claims 1 and 26 have been amended, claims 2-25 and 32-33 have been cancelled without prejudice to their future prosecution, and new claims 34-48 have been added. Claims 1, 26-30, and 34-48 are presently pending. It is submitted that no new matter has been introduced into the present application by the amendments to the claims or by the new claims. The Examiner is kindly requested to reconsider the present application in its amended form.

I. No New Matter has Been Added by this Response

It is submitted that no new matter has been introduced into this application by the present amendment. For example, support for the amendments to claim 1 can be found at equations 1 and 7 of the present application, along with the related text describing such equations. Support for the amendments to claim 26 can be found at equation 9 of the application as originally filed along with the related explanatory text. Support for new claims 34-40 can be found at Figure 2 of the application as originally along with the related explanatory text. Support for claims 41-48 can be found at formulas 7 and 9 of the application as filed along with the related explanatory text. The Examiner is urged to contact the undersigned attorney if it is believed that further explanation is needed with respect to where any of the claim amendments or new claims are supported by the application as originally filed.

II. Claim 1 Relates to Patentable Subject Matter

In the Office Action of February 22, 2007, claim 1 was rejected under 35 U.S.C. § 102(e) as being anticipated by United States Patent No. 6,983,589 to Lewis et al. Claim 1 was also rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 6,415,602 to Patchett et al. These rejections are respectfully traversed. However, in the interest of expediting prosecution, claim 1 has been amended to clarify certain inventive aspects.

In recent years, government regulations pertaining to diesel exhaust emissions have become increasingly more stringent. This is particularly true with respect to the emission of particulate material. To comply with the more stringent regulations, diesel particulate filters are widely used to lower particulate emissions. Diesel particulate filters are extremely effective at removing particulate material from diesel exhaust and often achieve filtration efficiencies well in

excess of 90%. However, diesel particulate filters are also prone to plugging. To overcome the plugging problems, it is necessary to periodically regenerate the diesel particulate filters by burning the collected particulate matter/soot from the diesel particulate filters. To efficiently regenerate a diesel particulate filter, it is important to provide an exhaust gas temperature that supports regeneration. If the exhaust gas temperature is to low, regeneration will not occur. In contrast, if the exhaust gas temperature is to high, uncontrolled combustion can occur at the diesel particulate filter leading to core cracking or worse. With the increased dependence upon diesel particulate filters, there is clearly a need for improved ways for regenerating diesel particulate filters.

The invention of claim 1 relates to an effective strategy for controlling the exhaust gas temperature provided to a diesel particulate filter during regeneration. The invention involves a formula/model based approach derived from a transient energy balance equation for a control volume that includes both a catalytic converter and a fuel dispenser. The transient energy balance equation includes a number of factors such as: (1) a net energy carried by the exhaust stream entering and leaving the control volume; (2) a heat release rate of the fuel to be dispensed into the control volume by the fuel dispenser taking into consideration a fuel vaporization efficiency and a fuel conversion efficiency at the catalytic converter; and (3) a heat transfer rate between the catalytic converter and the exhaust stream. The formula based approach allows for the fuel dispensing rate to be precisely controlled such that combustion of fuel at the catalytic converter provides a target exhaust gas temperature downstream of the catalytic converter. The target exhaust gas temperature is suitable to cause control regeneration of the diesel particulate filter. As described at page 3, lines 7-20 of the present application, this formula-based approach allows the fuel delivery rate to be quickly modified in response to variations in the operating conditions of the exhaust system without requiring a large amount of testing as might be required by strictly empirical modeling approach. Moreover, the formula-based approach can be effectively implemented without requiring a large number of input sources.

Lewis and Patchett both relate to exhaust treatment systems designed to reduce NOx emissions. Neither reference provides any disclosure of a method for providing controlled regeneration of a diesel particulate filter. While Lewis and Patchett both disclose dispensing a reductant into an exhaust stream, the amount of reductant supplied to the exhaust stream is not linked in any way to achieving a target exhaust temperature suitable to cause controlled

regeneration of a diesel particulate filter. Instead, in each reference, the amount of reductant supplied is tied to the amount of NOx desired to removed from the exhaust stream. For example, the fuel injection rate of Lewis is selected to improve the NOx conversion efficiency at the Active Lean NOx Catalyst (ALNC) (see column 3, lines 24-30 of Lewis et al.). Also, in Patchett, the rate at which reductant is metered into the exhaust stream is dependent upon a concentration of NOx in the exhaust stream (see column 17, lines 10-14 of Patchett). Thus, based on the above teachings, neither Lewis et al. nor Patchett et al. provide any disclosure for controlling the fuel dispensing rate to reach a target exhaust gas temperature downstream of a catalytic converter, as claimed.

Additionally, neither reference discloses selecting a control volume that includes both a fuel dispenser and a catalytic converter, as claimed. Moreover, neither reference discloses the use of a transient energy balance equation dependent upon factors such as the heat release rate of the fuel to be dispensed into the control volume by the fuel dispenser taking into consideration a fuel vaporization efficiency and a fuel conversion efficiency at the catalytic converter.

For at least the above-identified reasons, it is submitted that claim 1 is not anticipated by either Lewis or Patchett. Therefore, withdrawal of the rejections of claim 1 based on these references is respectfully requested.

III. New Claims 34-48 Relate to Patentable Subject Matter

Claims 34-48 depend upon and further limit claim 1. Therefore, for at least the same reasons specified with respect to claim 1, it is submitted that such dependent claims are patentable over the cited prior art.

IV. Claim 26 Relates to Patentable Subject Matter

In the Office Action of February 22, 2007, claim 26 was rejected under 35 U.S.C. § 102(e) as being anticipated by United States Patent No. 6,983,589 to Lewis et al. Also, claim 26 was rejected under 35 U.S.C. § 102(b) as being by United States Patent No. 6,415,602 to Patchett et al. These rejections are respectfully traversed. However, in the interest of expediting prosecution, claim 26 has been amended to clarify certain inventive aspects.

Claim 26 now recites that the mean temperature of the substrate is "calculated and updated on an on-going basis taking into consideration a heat transfer coefficient between the

exhaust stream and the substrate, a mass of the substrate, a surface area of the substrate, a specific heat of the substrate and an average temperature of the exhaust stream based on readings taken by the first and second temperature sensors." This combination of limitations is not taught or suggested by either Patchett et al. or Lewis et al. At columns 22 and 23 of Patchett et al., formulas for calculating the temperature of a substrate are provided. However, the formulas do not take into consideration factors such as the surface area of the substrate or the heat transfer coefficient between the exhaust stream and the substrate. At column 4 of Lewis et al., formulas for calculating an exotherm that occurs at a catalyzed substrate. However, once again, the formulas do not appear to include factors such as the surface of the substrate or the heat transfer coefficient between the exhaust stream and the substrate. For at least the above-identified reasons, it is submitted that claim 26 is not anticipated by either Patchett et al. or Lewis Jr. et al. Therefore, withdrawal of the rejections based on such references is respectfully requested.

V. Claims 27-31 Relate to Patentable Subject Matter

Claims 27-31 depend upon and further limit claim 26. Therefore, for at least the same reasons specified with respect to claim 6, it is submitted that such dependent claims are patentable over the cited references.

VI. Information Disclosure Statement

Included with this response is an Information Disclosure Statement listing numerous prior art references. Also included with the Information Disclosure Statement are several documents relating to the PCT search and examination of International Application No. PCT/US2005/045505. These documents are being submitted because the claims examined by the PCT Examiner were similar to claim 26 of the present application, and the Examiner provided rejections of these claims. While Applicants disagree with the basis for the Examiner's rejections, they are being submitted herewith for consideration by the United States Patent and Trademark Office in the present application.

VII. Conclusion

In view of the above amendments and remarks, it is submitted that the present patent application is in immediate condition for allowance and notification to that effect is respectfully requested. Please direct any inquiries concerning this application to the undersigned attorney at 612.336.4617.

Respectfully submitted,

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